



Oversight Procedure 40 – Risk and Contingency Review

1.0 PURPOSE

The purpose of this Oversight Procedure (OP) is to describe the review, analysis, and recommendation procedures and reporting requirements expected by the Federal Transit Administration (FTA) from the Project Management Oversight Contractor (PMOC) as regards risk associated with the Grantee's project and the Grantee's plan for mitigating and managing risks through various means including the use of cost and schedule contingencies.

2.0 BACKGROUND

The reliability of the Grantee's project scope, cost estimate, and schedule over the course of the project life is extremely important, not only for the success of the individual project, but also for the professional credibility of the transit industry including FTA.

3.0 OBJECTIVES

This review requires an evaluation of the reliability of the Grantee's project scope, cost estimate, and schedule, with special focus on the elements of uncertainty associated with the effectiveness and efficiency of the Grantee's project implementation and within the context of the surrounding project conditions.

This OP requires the PMOC to synthesize available project information; explore and analyze uncertainties and risks; provide a qualitative and quantitative assessment of ranges of forecasted cost and schedule; describe the analytical methods used; consider risk mitigation options and alternatives including use of cost and schedule contingencies; draw conclusions; and provide recommendations for adjustment to scope, cost, schedule project delivery method, construction methodology, and project management planning in order to respond to project risk.

FTA may direct the PMOC to conduct this review prior to major milestones in a project's life. This review is useful for projects using any project delivery method: Design-Build-Build (DBB), Design-Build (DB), Construction Manager/General Contractor (CM/GC), etc.

The PMOC's review under this OP is a critical input to FTA's decision regarding project advancement and funding.

4.0 REFERENCES

The statutes, regulations, policies, guidance documents and circulars in OP 01 Administrative Conditions and Requirements apply.

5.0 GRANTEE'S SUBMITTALS

In advance of performing the review, the PMOC should obtain and study the documents listed in Appendix B, as appropriate for the particular project phase. Many of these documents will have been obtained through the review of scope, schedule, cost, and Grantee technical capacity and capability in other OPs. The PMOC should perform an initial review and notify the FTA of important discrepancies in the project information that would hinder the review; an example would be insufficient detail or a mismatch between drawings and cost estimate in which the drawings are current and the cost estimate is significantly older.

6.0 SCOPE OF WORK

6.1 Overview

The scope of this review includes project risk identification and assessment, mitigation recommendations, and contingency assessment. In general, components of the review process are described in the order in which they are to be performed.

This risk management review builds upon the review of scope, schedule, cost, and Grantee technical capacity and capability in other OPs. Through this review, risks are identified, assessed, responded to through mitigation measures, and managed through a management plan.

Interface with the Grantee during the risk review facilitates the process and provides the Grantee with the background necessary to incorporate the risk review recommendations into its Project Management Plan. A typical structure for Grantee interface meetings is presented in Appendix C.

6.1.1 Organizing the Assessment by FTA Milestones

Risk assessments should be developed consistently around points in time. The following FTA Milestones reflect FTA review and approval points and percentage of construction completion:

- Entry in Preliminary Engineering;
- Entry into Final Design;
- FFGA award;
- 40% of the contracted value has been bid and contracted;
- 20% construction;
- 50% construction;
- 75% construction; and
- 90% construction.

The FTA Milestones may be modified to reflect important milestones in the Grantee's schedule, especially those points where significant changes in risk occur. If FTA Milestones and PMOC-added milestones are more than one year apart, the PMOC should consider developing supplemental milestones.

6.2 Project Status Evaluation

While the basic goal of the risk review is to identify and quantify uncertainties and their potential impacts on a project's estimate and schedule, the necessary first step of the risk review is to scrutinize the status and soundness of the project's basic—and known—elements. These elements (such as scope, design

quality, preliminary cost figures, and schedule) serve as the starting points for identifying risks and opportunities. It is, therefore, crucial that these known project elements be validated or, if necessary, corrected before attempting to address a project's uncertain elements. For example, if key components are missing or known costs are seriously understated, it will be very difficult to accurately assess the basis from which costs are expected to vary.

The project status evaluation is a precursor to the detailed risk review. The completeness and accuracy of the risk review is highly dependent on the completeness and accuracy of the project status evaluation. The project status evaluation includes evaluation of Grantee Technical Capacity and Capability, Scope, Cost and Schedule (all reviewed under separate OPs); as well as evaluation of the Grantee's contract packaging strategies.

6.2.1 Contractual Risk Allocation Review

The PMOC shall review the Grantee's Project Management Plan and supporting documents to characterize and provide a report of the sufficiency of Grantee's design and construction contracting as it applies to allocation of risk among the parties, and equity of compensation therefore.

6.2.1.1 Contractual Risk Allocation

The PMOC shall review the Grantee's strategy for or actual contracting documents to discover proposed or actual allocation of risk between Grantee and third parties, and shall develop a comprehensive schedule of key contractual risk assignments, including:

- Risks explicitly assigned through contract scoping language, including instances of work assignments where risk consequences are apportioned among several parties, including Grantee; partial apportionment of risk liabilities should be exposed;
- Risks implicitly assigned through industry customs, legal precedent, or statutory authority;
- Contractually-established risk mitigation pools, such as contingency of any type, management reserves, undistributed budget, incentive fees, variable profits, etc.; state where such pools are subject to shared savings provisions;
- Contractually-expressed limitations to liability of known risks, as available to any party;
- Significant known risks for which no contractual assignment is apparent, especially those for which the Grantee will suffer liability; and
- Significant insurance provisions that affect the assignment of liability of risk.

6.2.1.2 Contractual Risk Allocation Compensation

Utilizing information developed in prior reviews, including the OP on Contract Packaging and the OP on Capital Costs, the PMOC shall fully identify, describe, and analyze the anticipated or actual contractual risk allocation-based pricing/compensation components such as overheads, contingency and "contingency like" components, and any negotiated profit/fee values therefore in the Grantee's third party contract language. The PMOC shall evaluate the degree to which such contractual compensation components are aligned with the Grantee's base estimate, schedule, project strategy, and risk management plan; and shall assess their effectiveness in terms of minimizing costs (and cost overruns) and schedule (and schedule slippages).

6.2.1.3 Contractual Risk Allocation Assessment

The PMOC shall assess and evaluate proposed contractual allocations of risk and expected compensations

therefore, and shall comment on the potential cost-to-benefit balance and effectiveness of such assignments. Where actual assignments have been made, the PMOC shall evaluate amounts of liability that remain with Grantee, including potential incapability of the third party to sustain its assigned liability if faced with a loss.

It is the intent of this assessment to judge whether any contractual risk allocation provides a fair and reasonable trade off against the actual costs of foreseeable risk events, offers the opportunity to reduce total project cost, and does not represent risks which would be more reasonable for the Grantee to retain or accept.

A listing of suggested considerations for contract risk assessment is presented in Appendix D.

As appropriate, the PMOC shall make recommendations to achieve a more effective risk allocation strategy, to develop more effective negotiations for allocated risks, or to otherwise improve the value added by choice of project delivery method.

6.3 Identification and Categorization of Risks – Risk Register

The PMOC shall obtain current documents, reports, and observations developed through prior analysis of the Grantee’s organization, the project’s scope, cost estimate, schedule, and contract packaging to develop a synthesized, enumerated list of identified risk events. This list shall be supplemented with additional risk events as the PMOC may discover through joint discussion with the Grantee, including discussion of the Grantee’s prior parallel efforts at risk identification. This “Risk Register” shall include a description of the potential risk event; its qualitatively-evaluated potential consequences and likelihood of occurrence; its SCC category and risk category; the contract package in which it falls (where appropriate); and potential actions to mitigate the risk.

Risk identification plays a significant role in the overall risk management process. Sufficient efforts should be made to ensure that adequate resources and processes are used to develop a thorough listing of risk events, appropriate to the current project phase. This listing provides the basis for development of risk mitigation action items, and is used to inform the PMOC as it develops its risk management and mitigation recommendations.

6.3.1 Risk Events

Risk Events are individually identified contingent, or unplanned, events that may occur and which may create a plan variance and may be cause for special management scrutiny or action. Such events, or a combination of such events, do not represent all risk present on a project, and the identification or disposal of risk events may only become possible as the project proceeds through its various phases. Therefore, risk event identification may require periodic updates as a project progresses.

6.3.2 Risk Categories

Risk shall be characterized as belonging to any of the following categories, which are listed in chronological order; generally, risk is categorized as associated with the category during which the risk may be earliest and best mitigated. The categories are listed below. If a risk event is not disposed of during a particular phase, it may survive into the following phase.

Requirements Risk relates to the establishment and variability of fundamental goals and conditions of a

project to which the design must respond, as well as the activities of the Grantee to actively identify these goals and conditions. Generally, requirements risk is associated with all project development activities from earliest concept through Alternatives Analysis. A significant portion of Requirements Risk can be attributed to the potential influence of project stakeholders if project goals and requirements are not fully defined.

Design Risk is associated with the performance and variability of design-related activities occurring after Alternatives Analysis. Substantially complete design risk is indicated when no material design-related non-conformances are detected through the scope review; the estimate review indicates that 95% of all construction direct cost activities are shown on both design deliverables and cost estimate; and the schedule review indicates that no project level critical path element or procurement activity exceeds 45 calendar days (or other reasonable minimum) in duration.

Market Risk is related to the procurement of construction services, materials, and equipment and the variability associated therewith. This risk refers to both the effects of the open-market pricing of goods and services, as well as the effects of the Grantee's contract packaging strategies.

Construction Risk includes both risks that are due to the inevitable variability of the project's environment—including such items as unusual weather, unexpected subsurface conditions, and unexpected construction contractor failure—as well as performance risk that is manageable by the Grantee and its consultants and contractors—for example uncertainty surrounding mobilization of a tunnel boring machine and its planned production rates. Construction risk is subdivided into: Early Construction Risk (composed of Geotechnical/Utility activities, usually associated with 20% complete), Mid-Range Construction Risk (associated with coordination of contractors, etc.), and Start-Up/ Substantial Completion Risk (associated with 90% complete).

6.3.3 Contract Packaging Risk Identification

The PMOC shall identify potential events which may cause variance in the transference of risk—differing from assumptions in the Grantee's estimate and schedule. The fundamental principle involved in contractual risk identification is that risk should be allocated among the parties in proportion to their ability to manage the risks and absorb the consequences; that any transfer of risk to a third party is done so on an equitable basis of compensation given for risk accepted; and that violation of this principle may result in unexpected or unrecognized potential future cost or delay.

6.3.4 Example of risk register

An example partial risk register is included in Appendix E.

6.4 Risk Assessment

6.4.1 Cost Risk

The PMOC shall use its professional judgment and objective cost data to sequentially summarize, adjust, and condition the Grantee's estimate to empirically establish parameters for the assumed range of cost risk on a category-by-category basis. These parameters will then be used to simulate the magnitude of project risk and establish the potential responses to manage the risk. The project risk simulation is accomplished through the use of an electronic workbook that has been developed by the FTA.

Cost Risk is fundamentally about risk to the project budget. Risk events associated with cost risk may also threaten the planned schedule.

Cost Risk Assessment Workbook The FTA cost risk assessment workbook is a project-level risk assessment tool that has been developed through implementation on many FTA transit projects. Its features have become accepted as common starting points for creation of a project-specific cost risk assessment workbook. The FTA model cost risk assessment workbook has been developed to illustrate these common features and to serve as a starting point for a particular project. This workbook is based on the summary organizational structure of the FTA Standard Cost Categories (SCC) 10 through 80 for the capital cost elements of a project; SCC category 90 (contingency) is specifically excluded as a duplicate measure of risk. Risk for SCC category 100 (finance charges) is not covered in the standard FTA risk range factors for categories 10 through 80; the PMOC shall provide its opinion regarding such finance cost risk, and shall indicate its assessment of a reasonable range of variance from the finance costs estimated by the Grantee. The cost risk assessment workbook illustrates the formats and bases of calculations to properly execute the cost risk assessment described herein. The PMOC shall become fully familiar with the cost risk assessment workbook prior to undertaking the work of this section. The PMOC shall adjust the FTA cost risk assessment workbook as appropriate to meet specific project conditions.

Refer to OP 40 Excel Workbook.

6.4.1.1 Standard Cost Category (SCC) Grantee Estimate Adjustments

Stripped Cost Estimate Based upon analyses performed in accordance with the OP associated with the review of the cost estimate, the PMOC shall adjust Grantee's cost estimate to remove all contingency funds embedded therein. Such contingency funds to be removed may include both unallocated funds (usually applied as a percentage of summary costs) and allocated funds (usually applied as increases to individual estimate line items). Both patent (or exposed) contingency funds and latent (or hidden) contingency funds shall be identified; the identification of latent contingency funds will likely involve interviews with the Grantee. Further, particular attention should be paid to contingent funds that may be embedded within estimates for inflation or escalation risk.

Once identified, these contingency funds shall be quantified and removed from the estimate to form a Stripped Cost Estimate.

Adjusted Cost Estimate Utilizing scope, cost, schedule, contract packaging etc. information developed in prior-performed analyses prescribed by Operational Procedures, the PMOC shall appropriately revise the Stripped Cost Estimate, increasing or decreasing the various estimate line items to produce an Adjusted Cost Estimate. Care should be taken to identify whether items so adjusted should also become elements of the Risk Register. Any such adjustments and their rationale shall be fully documented. Note that the adjusted estimate, at a minimum, shall include one level of breakdown below the standard SCC Cost Elements [e.g.10.01, 10.02, etc.] Finally, the estimate shall be inflated to the year of expenditure (YOE), which becomes the basis for the ensuing risk assessment. Note that the inflation rate used for developing the Adjusted Cost Estimate should be a rate that is stripped of contingency, in a similar manner that occurs with other estimate line items. As noted below, this Adjusted Cost Estimate, appropriately stripped of contingencies, establishes a highly optimistic level of cost forecast for the various estimate line items, useful for assessing the range of risk for the line item.

Subsequent analyses of risk depend upon accurate estimate adjustments. Where possible, and especially

in the case of significant adjustments, the PMOC should strive for consensus of the FTA, PMOC, and Grantee in such adjustments before moving forward with the risk assessment.

6.4.1.2 Standard Cost Category (SCC) Risk Assessment

SCC Cost Element Ranges Utilizing the procedures outlined below, the PMOC shall establish likely ranges of cost for estimated line items, or elements, within the SCC, spanning the range of 10% likelihood to 90% likelihood; that is, the range from which there is only a 10% chance of cost underrun to the point at which there is 90% likelihood that costs will be lower. For the purposes of this SCC Cost Element Range assessment, it shall be assumed that the probabilistic range of cost follows a lognormal probability distribution curve, which models historically optimistic project estimates. These ranges shall be established as follows:

- **Lower SCC Cost Element Range Establishment** The Adjusted Cost Estimate (with contingency funds removed) for each SCC Cost Element is to be established as the lower (or 10%) value of the SCC Element Cost Range.
- **Upper SCC Cost Element Range Establishment** The PMOC shall establish the upper (or 90%) SCC Cost Element Range value through multiplying the Lower SCC Cost Range value by a range factor (hereinafter referred to as the Beta Range Factor or BRF); i.e., 90th percentile = BRF*10th percentile.

Beta Range Factor Establishment The PMOC shall establish the Beta Range Factor values through a process of initially utilizing the guidelines indicated below, and then varying the developed Beta Factors based upon specific project situations (especially including those noted in the Risk Register), in discussion with the Grantee and FTA work order manager.

Beta Range Factors are sums of Risk Category factors; i.e., total risk for an SCC element is the sum of the individual Risk Category Factors for Requirements Risk, Design Risk, Market Risk, and Construction Risk, added to a base factor of 1.05. The base factor of 1.05 provides for a 5% end-of-project risk allowance, which recognizes that risk generally remains, even at the end of construction.

The standard BRFs are presented in Table 1 and Figure 1. Note that at any given point in a project, SCC Category or sub-category cost elements may be comprised of cumulative levels of risk from any or all of the categories shown.

Table 1 - Beta Range Factors by Risk Category

<u>Risk Category</u>	<u>Risk Category Factor</u>		
Requirements Risk	Per WOM direction		
Design Risk	0.50		
Market Risk	0.25	<u>Construction Risk Sub-Factor</u>	
Construction Risk	0.70		
Early Construction			0.40
Mid Construction			0.15
Late Construction		0.15	

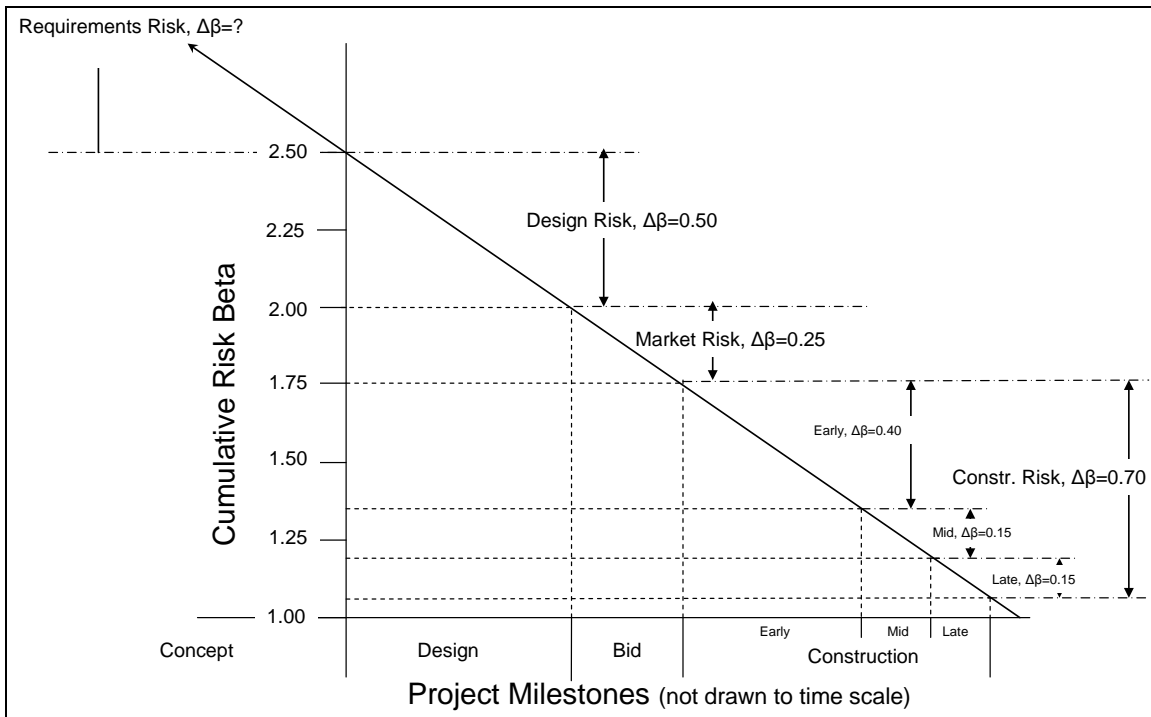


Figure 1 - Beta Risk Factor by Project Milestone

Appendix F presents guidelines for the PMOC to use when assigning BRFs.

SCC Cost Item Risk Curve Establishment The mean and variance of the suggested range distribution for the SCC cost item are fully determined using the 10th percentile estimate, the BRF, and the assumed lognormal distribution. These calculations are modeled in the Cost Risk Assessment Workbook.

Project Delivery Method Influence For traditional project delivery methods, the PMOC shall use the above recommendations and procedures. Other project delivery methods may generally affect the timing and scope of risk sharing but not necessarily the magnitude of risk nor the sequence of risk mitigation. Traditional project delivery methods (Design-Bid-Build) transfer or share much of the construction risk at the completion of design and market risk mitigation. Alternative project delivery methods such as Design-Build may transfer or share some components of requirements, design, market, and construction risk prior to the completion of design activities. The extent and effectiveness of risk transfers and sharing inherent in such alternative project delivery methods should be considered when developing recommendations for BRF assignment.

6.4.1.3 Project Level Cost Risk Assessment

Project-level risk is an aggregated amount of the risk associated with all of the SCC Category Cost Ranges. It is assumed to be normally distributed and partially correlated at 33 percent of the difference between the fully independent and fully correlated cases. The Cost Risk Assessment Workbook develops these calculations. The project level risk model shall be successively modeled and iteratively advanced at each future Project Milestone.

The PMOC shall produce, using the Cost Risk Assessment Workbook, a summary table and chart that lists the Grantee's estimated values and the PMOC's adjusted project costs with its assessment data, including the variability determined in the risk assessment and its effect on the overall budget. The

PMOC will then identify, in a narrative format, the key risk drivers through an analysis of those project elements with large cost risk impact.

The FTA may direct the PMOC to perform additional analyses as appropriate to provide further insight into the project-level risk assessment.

6.4.2 Project Schedule Risk

The PMOC shall use its professional judgment and objective schedule data to sequentially summarize, adjust, and condition the Grantee's schedule to empirically establish estimates for the assumed range of schedule risk on a summarized activity-by-activity basis. These parameters will then be used to simulate the magnitude of project schedule risk and establish the potential responses to manage the risk. The project risk simulation is accomplished through the use of an electronic program that may stochastically model sufficient iterations of random activity durations to adequately represent the risk associated with the project's schedule outcomes.

Schedule Risk is risk to the project schedule critical path directly delaying the project, or to any other significant activity, the delay of which may reduce schedule float, schedule contingency or threaten the project estimate. Note that schedule risk may also indicate cost risk.

6.4.2.1 Grantee Schedule Adjustments

Stripped Schedule Based upon analyses performed in accordance with the OP associated with the review of the Schedule, the PMOC shall adjust Grantee's schedule to remove all contingency durations embedded therein. Such contingency durations to be removed may include both unallocated (usually applied as a dummy activity at the end of the project or sub-network) and allocated (usually applied as increases to individual activity durations). Both patent (or exposed) contingency durations and latent (or hidden) contingency durations shall be identified; the identification of latent contingency durations will likely involve interviews with the Grantee. Further, particular attention should be paid to contingent durations that may be embedded as lag time hidden within the activity logic ties.

Once identified, these contingency funds shall be quantified and removed from the schedule to form a Stripped Schedule.

Adjusted Schedule Utilizing scope, cost, schedule, etc. information developed in prior-performed Operational Procedures, the PMOC shall appropriately provide suggested revisions to the Stripped Schedule, increasing or decreasing the various activity durations to produce an Adjusted Schedule. Any such adjustments and their rationale shall be fully documented. Note that the adjustments may be applied to the activities developed in the Summary Schedule, described below.

Subsequent analyses of risk depend upon accurate schedule adjustments. Where possible, and especially in the case of significant adjustments, the PMOC should strive for consensus of the FTA, PMOC, and Grantee in such adjustments before moving forward with the schedule risk assessment.

6.4.2.2 Summary Schedule Development

To aid in efficient and effective attribution of risk, the PMOC shall develop a summary schedule that will be used for modeling project schedule risk. The summary schedule shall be a mechanically-correct critical-path method schedule that adequately reflects the interrelationships among its activities so as to

model the effect of a variation in any activity upon the other activities. The number of activities modeled should be commensurate with the Grantee's schedule and level of detail available at the time of analysis; very large models are, however, generally difficult to assess and the principles underlying risk attribution may be difficult for all audiences to understand. Therefore, the PMOC shall establish a summary schedule for risk assessment purposes which, in its professional judgment, strikes a reasonable balance between transparency and level of detail required for sufficient risk assessment.

6.4.2.3 Schedule Activity Risk Assessment

The PMOC shall establish the duration ranges for the activities of the Summarized Schedule through a process of evaluating the specific project attributes (especially including those noted in the Risk Register), in discussion with the Grantee and the FTA. The "adjusted" schedule duration shall be used to establish the optimistic estimate for the activity duration. The PMOC shall use its professional judgment to establish the most likely and pessimistic estimates for the activity duration, or other parameters required for the stochastic analysis. The choice of probability functions or other technical parameters used in the analysis should be clearly stated by the PMOC. Methods used in the analysis should be made clear to the Grantee, in order that the Grantee may review, comment upon, and ultimately embrace the results of the schedule risk assessment.

The PMOC shall utilize a commercially-available project scheduling system that is capable of critical path scheduling and stochastic modeling for probabilistically-described activity durations. This system will be used for capturing and reporting activity risk duration ranges, as well as reporting the resulting project-level schedule risk assessment.

6.4.2.4 Project Level Schedule Risk Assessment

The PMOC shall assess the likelihood of project completion within the timeframes estimated on Grantee's schedule, using a commercially available scheduling software program capable of stochastic schedule risk modeling. The schedule modeling shall successively and randomly develop alternate forecasted project completion dates, based upon the activity duration range input described above. Such modeling shall be undertaken by individuals fully capable of establishing modeling parameters and capable of interpreting the modeling results. This assessment shall include an evaluation of the predicted range of completion dates compared to the Grantee's scheduled milestones; evaluation of assigned activity duration ranges, including statistical information such as range, mean, minimum and maximums; and identification of critical and near-critical paths and the relationship between those paths and identified risk events. The FTA may direct other similar analyses.

Schedule risk assessment shall recognize that schedule risk is focused on the homogeneity and stability of the various project critical paths or near critical paths. A critical path is homogeneous when its activities are mapped out using a histogram and demonstrate a mode and mean activity duration that is within 10% of each other. A critical path is ideally stable when all delays on other paths consume their path float but do not result in a project delay and no event has consumed all float, becoming critical. The PMOC shall consider whether non-construction activities, such as vehicle procurement, may introduce a critical path that masks critical paths for construction activities; in such case, it may be prudent to temporarily remove the non-construction activities and perform a separate analysis on the thus-altered schedule.

Based upon its findings, the PMOC shall assess the sufficiency of the Grantee's base sequencing and schedule to adequately reflect the modeled interim and final milestone completion dates. The PMOC shall provide recommendations for adjustment to the Grantee's schedule and Project Management Plan to

reduce the risk of not meeting the project's schedule goals.

6.5 Risk Mitigation

6.5.1 Risk Mitigation Recommendations

The PMOC shall develop risk mitigation recommendations for adoption by the Grantee in its Risk and Contingency Management Plan, a part of the Project Management Plan; these recommendations shall be developed in accordance with the following, and shall be organized appropriately by Mitigation Structure (defined below), SCC, and Risk Type. Each mitigation recommendation shall include an indication of the Mitigation Type(s) (defined below) that best describe the mitigation recommendation.

6.5.1.1 Mitigation Structure

Mitigation structure refers to varying levels by which the Grantee and its consultants and contractors may respond to the risk events identified through the review processes described above. This structure consists of three parts: Primary Mitigation, Secondary Mitigation, and Contingencies.

Primary Mitigation occurs throughout the various project phases and is the result of the planned actions of the Grantee and its consultants and contractors as described in the Risk Management Plan portion of the Project Management Plan, as supplemented with the PMOC's recommendations resulting from this review. Such activities are scheduled at the earliest phase during which the mitigation activity may occur, and are expected to be completed on a timely basis to achieve the cost- and schedule-risk parameter targets at the end of that phase. Examples of mitigation might be completing design, or a geotechnical survey, etc.

Secondary Mitigation consists of pre-planned, potential scope or process changes that may be triggered when risk events occur that cause overruns of certain phase-based targets, described further below. Example events that may incur secondary mitigation include construction bids that are significantly over the estimate, or unexpected geotechnical hazards that are encountered, etc., such that the change is likely to cause a significant over-budget condition. Such "triggered" mitigation enables the Grantee to make cost reductions in a planned and orderly process and preserves contingencies for use later in the project. Secondary Mitigation is fundamentally different than value engineering, which is a formal, systematic, multi-disciplined process designed to optimize the value of each dollar spent.

Contingencies are set-aside estimated amounts (monetary set-asides for cost and time set-asides for schedule) that are included within the overall cost or schedule targets for the project. The amounts are designed to be used to overcome increases in cost or schedule that are due to potential risks, and for which no other mitigation measure is available. These contingency amounts may be associated with a particular activity or category of cost, or may be set aside in a general fund. In most cases, the amount of risk a project experiences reduces as the project progresses toward completion; similarly, it is expected that the amount of contingencies required for a project also decreases over time; however, at no time should the contingency be totally consumed until all project risk is removed—usually only at project completion or beyond.

6.5.1.2 Mitigation Types

The PMOC shall indicate which of the four Mitigation Types— Risk Avoidance, Risk Transfer, Risk Reduction, or Risk Acceptance—apply to its individual mitigation recommendations.

Risk Avoidance is available when a project element that is associated with certain potential risk events may be alternatively delivered through a less-risky process or design, or may be eliminated altogether. The PMOC shall clearly identify those risks that can be avoided or eliminated.

Risk Transfer occurs when the mitigation and the consequences resulting from a risk event become the responsibility of a party other than the Grantee; this may include a partial transfer (or risk sharing). The PMOC shall clearly identify those risks that can be shared with or transferred to a third party such as a contractor, consultant, or other governmental organization in the form of contract requirements, warranties, or insurance policies, etc. The recommendation may also be to reallocate scope in such a manner as to transfer risks to scope elements or contract packages that are better suited to mitigate risk.

Risk Reduction is a planned action that will either reduce the consequence or the likelihood of a risk event. The PMOC shall clearly identify the root cause of the risk event, how the root cause or its consequences will be reduced by implementing the PMOC's recommendation, and who the PMOC recommends within the Grantee organization or project team to carry out the risk mitigation scope element.

Risk Acceptance results from the recognition, in the PMOC's opinion, that further reduction of a particular risk would only come at the expense of the project's fundamental goals, such as unacceptable service loss or cost increase, etc. Risk acceptance may also be a preferred method to deal with those risks that are of a high level of impact yet low level of probability and that mitigating them would put undue financial burden on the project. The PMOC shall clearly identify those risks that it recommends the Grantee accept as inherent to the project. Risk Acceptance often involves the potential consumption of project cost or schedule contingencies, project schedule float, or an increase in either project estimate or schedule.

When providing recommendations, the PMOC shall only suggest Risk Acceptance when neither Risk Avoidance, Risk Reduction, nor Risk Transfer is available to fully mitigate the risk condition. However, PMOC recommendations shall recognize that there is a point in the implementation of the Grantee's project ("break point") where non-contingency mitigation becomes increasingly difficult to effect and beyond which Risk Acceptance through the use of project contingency funds is the only effective means to treat project risk. This "break point" between risk reduction and risk acceptance typically occurs at the point where all market risk has been mitigated, or early construction risk (geotechnical/utility) has also been mitigated, whichever occurs later. Prior to this "break point", unless otherwise provided for in a project strategy plan, primary or secondary mitigation is the first line of defense in order to preserve a minimum contingency balance t in order to provide sufficient funds for the completion of the project.

6.5.2 Primary Risk Mitigation Recommendations

The PMOC shall identify a unified list of prioritized cost and schedule risk mitigation measures that it recommends as actions to supplement the Grantee's Risk Plan within its Project Management Plan, including scope, deliverables, outcomes, and recommended completion dates. This list of measures shall be entitled "Primary Mitigation Deliverables and Outcomes." These measures should include those management activities directly related to performance by the Grantee, as well as its consultants. This list will serve as a means to provide recommendations and to monitor the reduction of project cost risk. The PMOC will also recommend progress-reporting intervals for tracking the performance of mitigation measures as well as any integration with the Grantee's overall program schedule and resource loading. All material assumptions shall be identified along with their rationales.

Mitigation activities associated with high risk project work elements are to be executed as early as possible to reduce the potential for loss. As the project proceeds, the ability to recover from loss decreases—possibly threatening the project contingency.

Mitigation measures should include actions related to partial risk transference, especially those risks transferred through construction contracting, ensuring that risk remaining with the Grantee is fully recognized and an effective risk response plan has been developed. The Grantee's project delivery methods and contracting plans, including its proposed terms and conditions, should offer a comprehensive approach to ensuring that all forms of third party compensation (especially non-competitive, negotiated compensation) and risk transference are aligned with the project estimate and schedule.

Schedule risk mitigation recommendations should specifically treat both critical path and non-critical path activities. Frequent changes in the configuration of the project critical path are disruptive and degrade the grantee's ability to efficiently and effectively implement the project. One role of schedule mitigation is to protect the critical path from non-critical path activities becoming critical themselves through two main objectives. The primary objective of schedule risk mitigation is keeping a necessary amount of path float between the project critical paths and all of the intersecting (or potentially intersecting) paths, i.e. to "buffer" the critical paths and thus preserve its stability. The secondary objective of schedule risk management is to keep significant risks (such as technical construction process risks) off of the project critical path, or minimize their duration if they are critical path activities. The general principle is that activities with high schedule risk should start and complete as soon as feasible.

6.5.3 Secondary Risk Mitigation Recommendations

The PMOC shall develop recommendations for activities to accomplish development of Secondary Risk Mitigation capacity. These recommendations shall include the targeted magnitude of the cost or time savings expected, as well as a description of the scope, deliverables, and outcomes of the activity. The PMOC will also recommend progress-reporting intervals for tracking the utilization and management of such mitigation capacities; as well as any integration with the Grantee's overall program schedule and resource loading. All important assumptions shall be identified along with their rationales.

Mitigation Targets are amounts of mitigation capacity that are recommended to be developed by the Grantee on a phase-by-phase basis, expressed as the total of estimated project cost plus project contingency plus Secondary Risk Mitigation capacity. These targets are developed using probability curves developed in the FTA cost risk assessment workbook. The amount of Secondary Risk Mitigation capacity to be developed for a given phase is the difference between 1) the project estimate including contingency (as adjusted by the PMOCs recommendations) and a target amount developed from the phase-appropriate probability curve in the risk assessment worksheet. Table 2 provides the recommended, phase-appropriate target factors to use to determine the target amount from the workbook probability curves. The PMOC may, with the FTA work order manager's approval, modify these targets based upon overlapping Grantee milestones, actual progress beyond a given phase, or additional milestones lying between these standard phases.

Table 2 - Mitigation Target Percentages

Milestone	Target Factor
Entry in Preliminary Engineering	10%
Entry into Final Design	30%
FFGA award	50%
40% bid	60%
20% construction	70%
50% construction	80%
75% construction	85%
90% construction	90%

It is noted that as a project progresses toward completion, it may become increasingly difficult to develop substantial amounts of Secondary Mitigation capacity, especially as the project enters construction. The PMOC shall carefully take into consideration the current status of design efficiency and the effect that development of Secondary Mitigation may have on the FFGA scope or possible reduction to transit capacity and level of service when making its recommendation regarding Secondary Mitigation.

6.5.4 Project Cost Contingency

The PMOC shall fully identify, describe, and analyze the adequacy of the grantee’s cost contingencies. This analysis shall be developed in consideration of three models: 1) the Beta Range Factor model (described above); 2) a “forward pass” establishment of contingency targets, using historically-developed parameters (described below); and a “backward pass” establishment of contingencies using project-specific information (described below). The PMOC shall use its professional judgment to evaluate the contingency requirements estimated by these three approaches, and shall establish an overall recommended set of minimum contingency levels, as described below.

6.5.4.1 Forward Pass Cost Contingency Analysis

The PMOC shall develop a “forward pass” set of minimum recommended cost contingency values for each of the Project Milestones and for additional points of significant changes of project risk, utilizing the following recommended values. The values shown below describe amounts of contingency, calculated as percentages of the adjusted, stripped estimate (excluding finance costs), that should generally be included in the total estimate for the milestone noted. If the PMOC believes that the recommendations should be adjusted due to unique project conditions, any such adjustments should be explicitly highlighted and justifications provided.

- At Entry into Preliminary Engineering, the working target for total contingency (the aggregate of allocated and unallocated cost contingency) is 30%.
- At Entry into Final Design, the working target for total contingency is 20%.
- At the award of an FFGA, the working target for total contingency is 15%.
- At 90-100% bid for the Grantee, or 90-100% subcontracted for the prime contractor in an alternative project delivery method, the working target for total contingency is 10%.
- At 50% physically complete for Construction, the working target for total contingency is 5%.

Where the PMOC has identified additional milestone points, it shall use its judgment to interpolate forward-pass contingency recommendations, based on the standard recommendations above. Many larger projects consist of multiple phases that may each exist at different levels of project completion. In such case, the PMOC should contact the FTA to obtain historic examples of contingency calculations that

account for such varying project phases.

6.5.4.2 Backward Pass Cost Contingency Analysis

The PMOC shall develop a “backward pass” set of recommended cost contingency values that represent the minimum amount of total cost contingency expected to be necessary at Project Milestones and as also consistent with forward pass milestones. Total cost contingency includes funds to offset costs for potential scope changes or clarifications as well as cost attributable to potential schedule changes or delays. The PMOC shall develop estimates of minimum total cost contingencies based upon its assessment of the project status and project risk. Items identified with the Mitigation Type of “Risk Acceptance” shall be specifically reviewed when performing the backward pass analysis.

This process begins by considering the final stages of the project (say 95% complete) and determining how large of a contingency fund should remain in the project budget to solve potential risk-laden events. This amount—often established through the judgment of project experts—becomes the minimum amount of contingency that should be maintained at that point. The next step is to consider another point in time when the project is less complete (say at 75% completion) and to similarly determine the size of contingency fund that should remain available. This process is completed—moving stage by stage toward the beginning of the project—until it appears that Primary Mitigation and/or Secondary Mitigation will be sufficient to recover from potential cost overruns.

The following considerations shall be made in development of the backward pass contingency values:

- At the Revenue Operations Date (ROD), the demand for total cost contingency has been reduced to a minimum requirement for scope changes or clarifications and schedule delays or changes. The PMOC shall evaluate the Grantee’s experience and other similar transit projects to identify an amount sufficient to close out punch list work, additional work orders, etc. The working target for this point is 1-3% total contingency, including 0-1% for schedule delay costs and the remainder for other costs.
- At the point that the project construction procurement is “substantially complete” (90-100% bid for either Design-Bid-Build or 90-100% subcontracted for alternative project delivery methods), the project is exposed to cost changes in the range of 15% of project costs, which includes 4-6% to reflect schedule delays that at this point can average 20% of the construction phase duration.
- For any potential delay duration greater than 9 months, the PMOC shall assume 3 months each of demobilization and remobilization with a variable standby period in between.

6.5.4.3 Cost Contingency Recommendation

Utilizing information developed from the Beta Range Factor (BRF) model, the forward pass, and backward pass contingency analysis, the PMOC shall establish a tabular and graphical Cost Contingency Curve that indicates minimum levels of contingency that must be maintained across the duration of the project. In its evaluation, the PMOC shall consider that the target value for 20% Construction as developed in the BRF model represents a point at which Secondary Mitigation is traditionally no longer effective, and therefore BRF model targets for 20% Construction and subsequent phases may represent minimum cost contingency values.

The PMOC shall use its professional judgment to consider the recommendations from each of the three models and shall develop recommended minimum contingency levels by phase which most reasonably reflect the specific project conditions. These minimum levels should be indicated for each of the FTA milestones, including additional milestones as identified by the PMOC for points of time at which

significant changes in risk may occur. These milestones, along with their minimum contingency levels are termed “Hold Points”, and are used to protect from inappropriately early draw down of contingency funds.

6.5.5 Project Schedule Contingency Review

The PMOC shall fully identify, describe, and analyze the adequacy of the Grantee’s schedule contingencies. The schedule contingency review shall be developed similar in manner to that of the “backward pass” used in the cost contingency review; that is, recommended schedule contingency amounts are developed through consideration of project conditions, accumulating minimum schedule contingencies from the end of the project toward the start of the project. The PMOC shall make recommendations as to what minimum amounts of schedule contingency are recommended for inclusion in the Grantee’s Project Management Plan and supporting schedules.

6.5.5.1 Schedule Contingency Analysis

The PMOC shall “step back” sequentially through various completion milestones for the project and shall estimate the minimum amount of schedule contingency required to complete the project on schedule, in consideration of risks identified in this OP.

The schedule contingency recommendations shall be developed using these fundamental assumptions:

- At the Revenue Operations Date (ROD), schedule contingency requirements have been reduced to a minimum requirement or possibly eliminated.
- At the point of 100% complete with bid (for Design-Bid-Build) or 100% subcontracted (for Design-Build or CM-GC), the project should have sufficient schedule contingency available to absorb a schedule delay equivalent to 20% of the duration from Entry into FD through Revenue Operations.

6.5.5.2 Schedule Contingency Recommendations

The PMOC shall develop a recommended amount of minimum total schedule contingency to be available for the project at each major milestone. Premature use of significant amounts of schedule contingency reduces the ability of the project to withstand schedule change. These minimum levels should be indicated for each of the FTA milestones, including additional milestones as identified by the PMOC for points of time at which significant changes in risk may occur. These milestones and minimum schedule contingency amounts are schedule contingency “hold points”, and are used to protect from inappropriately early draw down of contingency durations.

6.6 Development of Grantee’s Risk and Contingency Management Plan (RCMP)

Upon FTA approval, the PMOC shall make available to the Grantee the assessments and recommendations developed in this OP for inclusion in the Grantee’s Risk and Contingency Management Plan (RCMP), a section of the Project Management Plan. The PMOC shall work collaboratively with the Grantee, as the Grantee prepares and/or revises the Risk and Contingency Management Plan (RCMP) section of its Project Management Plan to reflect the recommendations and considerations provided by the PMOC.

The PMOC shall ensure that the RCMP consider all aspects of potential risk, including technical capacity and capability, project performance, cost and schedule risk. A recommended structure for the Risk and

Contingency Management Plan is included in Appendix G.

6.7 PMOC's Monitoring of Grantee's Risk and Contingency Management Plan

Post-assessment monitoring by the PMOC is intended to assess the Grantee's performance in risk management and ensure that the Grantee's project implementation achieves its risk management objectives and targets. The PMOC shall use the Grantee's Risk and Contingency Management Plan (RCMP), which has been collaboratively developed with the PMOC, as its guide for post-risk review monitoring.

Monitoring shall consist of evaluation and reporting of:

- The Grantee's prosecution of the Primary Mitigation action items, including the effectiveness of the action to mitigate the potential risk event and the timeliness of the completion of the action item;
- The occurrence of risk events on the project, whether or not previously identified, and their estimated effect on the project's cost and schedule goals;
- The use of cost and/or schedule contingencies and whether such use threatens minimum levels of contingency required for future phases;
- Successful implementation of other major initiatives noted in the RCMP; and
- The effectiveness of the Grantee's organization to fully manage its Risk and Contingency Management Plan.

7.0 REPORT, PRESENTATION, RECONCILIATION

The PMOC shall provide the FTA with a written report of its findings, analysis, recommendations, professional opinions, and a description of the review activities undertaken. After FTA approval, the PMOC should share the report with the Grantee. In the event that differences of opinion exist between the PMOC and the Grantee regarding the PMOC's findings, the FTA may direct the PMOC to reconcile with the Grantee and provide FTA with a report addendum covering the agreed modifications by the Grantee and PMOC.

The report formatting requirements of OP-1 apply. When necessary, the PMOC shall perform data analysis and develop data models that meet FTA requirements using Microsoft Office products such as Excel and Word and use FTA-templates when provided. The PMOC may add other software as required but documentation and report data shall be made available to FTA.

Prepare a written report in the format discussed in Appendix H. Attach the sponsor's most current SCC estimate, schedule, and other related documents. Embed references to, or exhibits from, Grantee's estimate, schedule or other documents to explain your analysis, findings, and recommendations.

Integrate and summarize available information and data for the project, providing professional opinion, analysis, information, data and descriptive text in an accessible and understandable format. Opinions shall be supported by data tables prepared in a professional manner.

APPENDIX A

Acceptable Quality Level

	DESIRED OUTCOME	PERFORMANCE REQUIREMENT	CHECK LIST	PERFORMANCE MEASURE	ACCEPTABLE QUALITY LEVEL	MONITORING METHOD
1	PMOC shall support FTA's programmatic decisions through review and analysis of Grantee's risk management process PMOC shall review, analyze and recommend to FTA regarding Project Contingency and Contract Packaging.	R1a. The PMOC shall develop and document a process for review, analysis and reporting to FTA of Grantee's risk assessment and risk management practices.		M1a. Evidence of a documented process.	Q1a. Process exists and has been followed.	MM1a. Periodic review by FTA or its agent.
		R1b. The PMOC shall use its process to analyze and advise FTA on Cost, Schedule and Contract Packaging and other project risk issues.		M1b. Documented assessment of overall Project Contingencies and Contractual Risk Allocations.	Q1b. Review must be made and the PMOC provides internal verification that the process as documented was followed.	MM1b. Periodic review by FTA or its agent.
		R1c. The PMOC shall develop and document a process for review and analysis of Grantee's Project Contingencies, Contractual Risk Allocations and Contract Packaging.		M1c. Evidence of a documented process.	Q1c. Process exists and has been followed.	MM1c. Periodic review by FTA or its agent.
		R1d. The PMOC shall use its process to analyze the adequacy, effectiveness and efficiency of Grantee's Project Contingencies and Grantee's management and risk management practices prior to each milestone, as directed by FTA.		M1d. Documented assessment of overall Project Contingencies, Contractual Risk Allocations and management practices.	Q1d. Review must be made and the PMOC provides internal verification that the process as documented was followed.	MM1d. Periodic review by FTA or its agent.
2	The PMOC shall utilize its experience and professionalism in monitoring Grantee risk management systems to produce required deliverables based on comprehensive systems analysis strategically repeated as the project advances. The PMOC shall review, identify, characterize and analyze project contingency availability, status and forecasts for critical project milestones and assure	R2a. PMOC Oversight Plan. The PMOC shall develop and submit a plan for providing surveillance of the Grantee's performance in risk management defining how services and products will be accomplished in a manner meeting FTA requirements.		M2a. Documented evidence of a risk management surveillance plan, supported by professional opinion.	Q2a. Professional opinion of risk management objectives and targets, other supporting documentation or submittals and recommendations for course of action.	MM2a. Periodic review by FTA or its agent.
		R2b. Cost Risk. The PMOC shall identify, assess and evaluate the uncertainties in Grantee's cost estimates in terms of project's social, political, legal, financial and physical environment and make recommendations regarding identified risks.		M2b. Documented evidence of review of Grantee's cost estimates, supported by professional opinion.	Q2b. Professional opinion and recommendations regarding identified items of likely risk.	MM2b. Periodic review by FTA or its agent.
		R2c. Schedule Risk. The PMOC shall identify, assess and evaluate Grantee's project schedule uncertainties in terms of social, political, legal, financial and physical environment and make		M2c. Documented evidence of review of Grantee's project schedule, supported by professional opinion.	Q2c. Professional opinion and recommendations regarding identified items of likely risk.	MM2c. Periodic review by FTA or its agent.

	DESIRED OUTCOME	PERFORMANCE REQUIREMENT	CHECK LIST	PERFORMANCE MEASURE	ACCEPTABLE QUALITY LEVEL	MONITORING METHOD
	Grantee's use of sound project management strategies.	recommendations regarding identified risks.				
		R2d. Non-Cost and Non-Schedule Risk. The PMOC shall, as directed by FTA, identify, assess and evaluate all non-cost and non-schedule related uncertainties and risks found in Grantee's project, including risks associated with Grantee's project delivery methods and strategies for packaging the contracts for construction, and make appropriate recommendations.		M2d. Documented evidence of review and evaluation of Grantee's non-cost and non-schedule related uncertainties, supported by professional opinion.	Q2d. Professional opinion and recommendations regarding identified items of likely risk.	MM2d. Periodic review by FTA or its agent.
		R2e. Risk Mitigation. The PMOC shall identify and characterize project risks, develop a risk mitigation plan and prepare a report showing its recommendations, including those for needed changes to Grantee's PMP.		M2e. Documented evidence of review and assessment of risk together with recommend changes to PMP and preparation of risk mitigation plan, supported by professional opinion.	Q2e. Professional opinion and recommended changes to PMP together with risk mitigation plan.	MM2e. Periodic review by FTA or its agent.
		R2f. The PMOC shall identify, describe and analyze the adequacy of Grantee's cost contingencies, make necessary recommendations and, through parameters developed using the "forward pass" and "backward pass" approaches, create the overall minimum contingency curve.		M2f. Documented evidence of a thorough review, analysis and description of Grantee's Cost Contingencies, supported by professional opinion.	Q2f. Professional opinion of Cost Contingencies.	MM2f. Periodic review by FTA or its agent.
		R2g. The PMOC shall develop a "Forward Pass" cost contingency analysis using historically-developed parameters and a "Backward Pass" cost contingency analysis using project specific data. This data shall be reconciled and a Cost Contingency Curve and graphics developed.		M2g. Documented evidence of forward and backward pass cost contingency analysis, and creation of cost contingency curve, supported by professional opinion.	Q2g. Professional opinion and review of all cost contingency analyses and creation of Cost Contingency Curve with graphics.	MM2g. Periodic review by FTA or its agent.
		R2h. The PMOC shall identify, describe and analyze the adequacy of Grantee's schedule contingencies making recommendations for minimum amounts of schedule contingency and supporting schedules.		M2h. Documented evidence and review of Grantee's Project Schedule Contingencies, supported by a professional opinion.	Q2h. Professional opinion and evaluation of Grantee's Schedule Contingencies.	MM2h. Periodic review by FTA or its agent.
		R2i. The PMOC shall "step back" at various milestones and estimate the minimum amount of schedule contingency required to complete the project on schedule. This data shall be used to develop a Schedule Contingency Curve.		M2i. Documented evidence of schedule contingency analysis and creation of schedule contingency curve, supported by a professional opinion.	Q2i. Professional opinion and review of all schedule contingency analyses and creation of Schedule Contingency Curve with graphics.	MM2i. Periodic review by FTA or its agent.

	DESIRED OUTCOME	PERFORMANCE REQUIREMENT	CHECK LIST	PERFORMANCE MEASURE	ACCEPTABLE QUALITY LEVEL	MONITORING METHOD
		R2j. The PMOC shall identify, describe and analyze Grantee's individual contract packages and a) Contract Packaging Strategy: characterize and report on the sufficiency of design and construction contract packaging strategies; b) Contractual risk Allocation: discover and report proposed or actual allocation of risk between Grantee and third parties; and c) Contractual Risk Allocation Assessment: evaluate proposed contractual allocations of risk and comment on potential cost-to-benefit balance and effectiveness of assignments.		M2j. Documented evidence, review and assessment of Grantee's Contract Packaging Strategy and Contractual Risk Allocations and supporting documents, supported by professional opinion.	Q2j. Professional opinion and Contract Packaging Review.	MM2j. Periodic review by FTA or its agent.
3	The PMOC shall document its findings, professional opinions, and recommendations in a report to the FTA for its Risk, Cost and Schedule Contingency, and Contractual Risk Allocation Reviews to the FTA. PMOC shall further attach SCC estimate, schedule and other related documents with Primary Deliverables and Sub deliverables.	R3. The PMOC shall present its findings, conclusions, analysis and recommendations to FTA and reconcile those recommendations with the Grantee to the extent possible when so directed by FTA.		M3. PMOC's findings conclusions, recommendations, and presentation.	Q3. Reports and presentations are professional, clear, concise, and well written. The findings and conclusions have been reconciled with other PMOC reports and have been reconciled with Grantee to the extent possible.	MM3. Periodic review by FTA or its agent.

APPENDIX B

Grantee's Submittals

GRANTEE'S SUBMITTALS

In advance of performing the review, the PMOC should obtain and study the following, as appropriate for the particular project phase. Many of these documents will have been obtained through the review of scope, schedule, cost, and Grantee technical capacity and capability in other OPs. The PMOC should perform an initial review and notify the FTA of important discrepancies in the project information that would hinder the review; an example would be insufficient detail or a mismatch between drawings and cost estimate in which the drawings are current and the cost estimate is significantly older.

Coordinate these submittals with those required for the OPs related to *Readiness to Enter Preliminary Engineering* and *Readiness to Enter Final Engineering*.

Programmatic

Alternatives Analysis Final Report
MPO adoption of the LPA into Fiscally Constrained Long Range Plan
TIP and STIP include the project for PE, Final Design, and Construction phases
Final environmental documents and NEPA determination

Scope / Project Definition

Basis of Design Reports, Design Criteria Reports
Project Plans, Drawings, and Specifications
Master Permitting Plan and Schedule
Geotechnical Baseline Report
Passenger Level Boarding Design documents
Vehicle design documentation
Transit Capacity and Operating Plan
Documentation of changes to scope that have occurred since last milestone

Project Management Plan and sub-plans

Program Management Plan (if applicable)
Basis for the Project
Environmental Assessment/Mitigation Plan
Design Control including but not limited to Value Engineering, Agreements with Railroads, Utilities, other Third Parties
Project Controls (Document, Scope, Cost, Schedule, Dispute)
Risk Assessment, Risk and Contingency Management Plan
Project Delivery and Procurement
Grantee Technical Capacity and Capability
Quality Assurance / Quality Control Plan
Safety and Security Management Plan
Real Estate Management Plan

Fleet Management Plan

Schedule

Project schedule in original and SCC format; schedule narrative describing critical path, expected durations, and logic

Cost Estimate

Summary of O&M Cost Assumptions/Productivities

Capital cost estimate in original and SCC format

Capital cost estimate backup documentation

Capital cost estimating methodology memo

Before and After Study Documentation

FTA Agreements

PE Entry Checklist (if applicable)

FD Entry Checklist (if applicable)

Record of Decision

Full Funding Grant Agreement and Attachments if available

APPENDIX C

Grantee Risk Interface

Interface with the Grantee during the risk review facilitates the process and provides the Grantee with the background necessary to incorporate the risk review recommendations into its Project Management Plan. A typical structure for Grantee interface meetings is as follows; the PMOC shall assess the level of project completion and familiarity of the Grantee with the risk review process to determine whether adjustments to the following structure is appropriate:

Kickoff meeting:

- Introduce PMOC team and Grantee team;
- Grantee presents the project to PMOC team;
- Agency organization, including project team and plan for staffing;
- Description of work and reviews over the previous year;
- Review of the project by discipline;
- Review of schedule, cost estimate, risk register if available;
- PMOC presents the risk process to Grantee; and
- Tour of alignment, station and support facility locations.

Workshop 1 (may be broken into two sessions): This workshop should occur after PMOC team has reviewed Grantee's documents, written and exchanged issue papers for each discipline, and has developed a summary schedule for risk assessment purposes (if schedule risk assessment is undertaken).

- Introduce PMOC team and Grantee team;
- Characterize PMOC's understanding of Grantee Technical Capacity and Capability, Scope, Cost and Schedule (all reviewed under separate Ops);
- Discuss summary schedule (if schedule risk assessment is undertaken);
- Discuss risks, categorized by SCC structure and/or summary schedule activity, identified by the PMOC and discuss and record any additional risks discovered during the workshop, including qualitative characterization of likelihood and magnitude of cost and/or schedule impact for the identified risks;
- Summarize findings, conclusions, recommendations, questions, and enter into discussions with the Grantee's project team to resolve open questions;
- Discuss actions required to facilitate the next stage of quantitative risk assessment; and
- Inform the Grantee of next steps in the risk assessment process.

Workshop 2: This workshop should occur after PMOC team has reviewed the risk listing, has assigned the cost Beta Range Factors and summary schedule activity duration ranges, and has developed recommendations regarding Grantee's target budget, contingency and risk mitigation.

- Introduce PMOC team and Grantee team;
- Describe the process used to develop the quantitative risk assessment;
- Summarize the key findings of the assessment;
- Provide recommendations regarding risk mitigation options and alternatives including possible changes to scope, budget, schedule, project delivery method, construction methodology, and/or use of cost and schedule contingencies;

- Review detail of individual risks, as appropriate, regarding the method of quantification of risk and which risks strongly influence overall project risk;
- Review specific recommended mitigation measures and solicit completion dates; and
- Discuss action items and next steps in the risk assessment and FTA review process.

APPENDIX D

Contractual Risk Review Guide

When assessing the Grantee's contractual risk allocation, the PMOC shall consider the following:

- A risk liability has been assigned to the party most capable of performing the activities necessary to reduce the risk; or instances where the consequence of significant risk is held by a party unable to control the outcome of the risk event.
- The ability of the Grantee or a third party to effectively perform activities necessary to reduce manageable, assigned risks.
- The ability of the Grantee or a third party to withstand the consequences of its assigned risk liability.
- Impacts to project costs, where costs are increased due to allocation of risk consequences to a third party.
- The ability of the Grantee's organization to effectively evaluate the cost-to-benefit balance between retaining or contracting significant risks and their consequences.
- Instances where the expected value of a contractually assigned risk liability appears unbalanced to the offsetting cost in contractual compensation in negotiated situations. This evaluation should include the following:
 - The degree to which such allocated risks are foreseeable and quantifiable and the degree of understanding among the parties involved of uncertainties in quantifications of the risks;
 - Estimation of the expected cost to the Grantee of the risk assignment, if the risk assignment were acquired through a competitive market. The PMOC may assume 4% profit as a reasonable starting point for market-based risk acquisition;
 - Estimation of the difference between the anticipated negotiated compensation and the market-based estimate for risk acquisition; and
 - A professional assessment of the comparison of costs between negotiated and competitive market-based risk acquisition, including its reasonableness and potential alternatives.
- Instances of significant risks that appear unconsidered in the contracting or contract packaging strategy.
- Recommended adjustments to prior-developed cost and schedule models if affected by contractual risk allocations.
- Safeguards in place, such as bonding or insurance, to protect Grantee in the case of failure of a third party to withstand the consequences of contracted risk liability (that is, where Grantee may become unexpectedly liable for previously transferred risk); alternatively, an assessment of risk liability that would remain with Grantee in the case of third party failure.

APPENDIX E

Example Risk Register

The following is provided as an example only of a risk register used for risk identification; the intention is to convey the basic content for a robust risk register. Other formats may be found useful, depending on individual PMOC practice and project-specific requirements.

Standard Cost Categories		Rsk Cat.	Contr. Pkg	Risk Identification and Description		Risk Assessment 1= Low, 2=Medium, 3 =High				Action
						Event	Outcomes	Prob p	Cost c	
20 STATIONS, STOPS, TERMINALS										
20.01	At-grade station, stop, shelter, mall, terminal, platform	R	N/A	Provision to Add a fifth station EW alignment	Track Change and ROW acquisition	2	2	0	4	Monitor to ensure it does not requires a supplemental
		R	N/A	Replacement of parking eliminated	Re-stripe. Potential Added ROW	3	2	0	6	Parking Mitigation Plan/Management Plan Monitor to ensure it does not requires a supplemental
		R	N/A	Added Aesthetic station features	Additional cost	1	1		1	Early communication with City, with input from Vancouver Working Group. Establish standards to support identification of betterments
		R	N/A	Interchange moves south and impacts existing Expo station	Add canopy to existing Expo Station	3	2		6	Add screening to Highway rather than canopy to station
20.02	Aerial station, stop, shelter, mall, terminal, platform	D	N/A	Added Aesthetic station features	Additional cost	1	1		1	
20.06	Automobile parking multi-story structure	R	N/A	City requires ground floor retail / architectural features	Added cost	3	2		6	Joint development. VE
		D	N/A	Unfavorable geotechnical conditions	Piles	1	2		2	Contingency
		R	N/A	Parking Reconfigure S.R. 14 and Mill Station	Added ROW	2	2	2	8	Alert environmental team. Additional design studies and communication with City on mass and traffic
20.07	Elevators, escalators		N/A	None					0	

APPENDIX F

Beta Range Factor Guidelines

The following guidelines apply for cumulative Beta Range Factors (BRF). Note that 1) the following BRF amounts are the sum of the individual risk category factors; 2) failure to remove a category of risk at a given phase indicates that some amount of that risk survives to the next phase—for example, Design Risk may exist during the construction phase if a design decision has been delayed; and 3) the cumulative factors here represent a range of observed risk across many transit projects and therefore increases to the suggested BRFs should only occur where exceptional risks are involved, beyond what would be expected by a “normal” project.

SCC10 through 50:

- A BRF above 2.5 implies uncertainty associated with project requirements, while a BRF of 2.5, implies all Requirements Risks have been mitigated (typically equivalent to 20-30% design completion expected at Entry to Preliminary Engineering);
- A BRF between 2.5 and 2.0 implies increasing mitigation of Design Risk. The fundamental premise is that the Beta Range Factor directly correlates to the percentage of design completion (20-30% design completion with a β of 2.5 and 100% with a β of 2.00);
- A BRF between 2.0 and 1.75 recognizes the existence of Market Risk (bid risks; uncertainties associated with reliable information on market conditions, short of a project specific firm price);
- A BRF between 1.75 and 1.35 implies the element has been successfully contracted for construction within budget. It recognizes uncertainties related to construction associated with geotechnical/utility, other underground, or other construction activities occurring during the first 20% of construction. Full mitigation of risk during this period for simple LRT stations that are the equivalent of bus pads is indicated by a BRF of 1.35, while full mitigation of risk for certain elements such as guideway or systems is indicated by a BRF of 1.50.
- A BRF between 1.35 and 1.20 (or between 1.50 and 1.20 for certain elements such as guideway or systems) indicates uncertainty associated with mid-construction risks inclusive of major claims, delays, impacts, etc., usually associated with 75% complete, have been mitigated; betas below this range imply increasing mitigation in the areas of normal change order activity.
- A BRF between 1.20 and 1.05 indicates uncertainty associated with late construction activities, including activities through start-up and substantial completion.
- A BRF of 1.0 implies that there is no risk or uncertainty of any kind associated with this item and represents the perfectly mitigated state of a project scope item.

SCC10 through 40

- Where exceptional geotechnical conditions exist, especially deep excavations and/or tunneling, the PMOC shall provide a separate analysis and explanation of the BRFs that apply to the corresponding estimate elements. Such BRFs may significantly exceed standard BRFs.

SCC60:

- Risk for Right-of-Way tends to survive later in time and suffer higher schedule risk than for those items in SCC 10 through 50; therefore cumulative BRFs shall be estimated at 50-75% greater than that of SCCs 10 through 50 when estimated during market and construction phases of the project.

SCC70:

- Risk for vehicles tends to be removed more quickly than for those items in SCC 10 through 50; therefore cumulative BRFs shall be estimated at 75% or less than that of SCCs 10 through 50 when estimated for Market and Construction phases of the project.

SCC80:

- Risk for professional services is highly dependent upon the phase in which they are performed. Therefore, for professional design-phase services, the cumulative BRFs should be mostly drawn down at the point at which the services have been largely complete. Conversely, services provided during construction will retain most of the risk until those services are provided. BRFs for other services in this category shall be estimated similarly.

APPENDIX G

Risk and Contingency Management Plan (RCMP) Structure

The Risk and Contingency Management Plan (RCMP) is a section of the Grantee's Project Management Plan (PMP); its successful implementation depends upon a fully updated and active PMP. It is the purpose of the RCMP to highlight specific areas of management focus as identified through the risk review process, which should be implemented along with Grantee's normal project operations as described elsewhere within the PMP. Further, it is the purpose of the RCMP to provide a means for monitoring Grantee's progress as it moves the project forward to its next phase. These areas of management focus may include actions to strengthen technical capacity and capability, project performance, cost and schedule analyses, mitigations of identified project risks, and others.

Information contained within the RCMP should complement and not be in conflict with information contained elsewhere within the PMP or in other FTA guidance documents. Such areas of concordance should include, for example, the project estimate and schedule, FTA's completion criteria for the various phases such as PE and FD, Master Checklists for being considered ready to proceed into the next phase, as well as associated FTA PMOC work products used to review the various technical elements of the project, etc.

Successful implementation of the RCMP is important to the goals of both the Grantee and the FTA, and monitoring of the RCMP implementation will be undertaken by both the Grantee and the FTA (through the PMOC). It is important, therefore, that the FTA, PMOC, and Grantee work collaboratively and develop agreement on the substance of the RCMP.

A recommended structure for the RCMP follows:

Overview

This section should indicate that the RCMP is a section of the over-arching PMP, including an indication of the latest version of the PMP upon which the RCMP is based. If the RCMP depends specifically on other sections of the PMP, those sections should be noted, including an indication of their latest versions.

A brief description of the important, actionable findings of the PMP should be included in the overview. If further actions are required to finalize the current draft of the RCMP, those should also be indicated along with expected completion dates.

A brief summarization of topics covered within the RCMP should be included, including such topics as:

Primary Mitigation, organized by significant project activities, such as:

- Technical Capacity
- Project Scoping and Design;
- Delivery Methods and Contracting;
- Construction Process;
- Project Tracking, including:
 - Cost Estimating, Financing and Financial Management; and

- Project Schedule Management.

Insurance:

- Professional services, construction phase, wrap-up, or other specialized insurances purchased for reduction of risk exposure.

Contingency Management:

- Cost Contingency Management Plan; and
- Schedule Contingency Management Plan.

Secondary Mitigation:

- Establishment of Secondary Mitigation actions and cost targets which may trigger the implementation of Secondary Mitigation.

Risk Management:

- Risks management and mitigation monitoring, change identification, and management controls.

Goals and Objectives

The major goals of the RCMP should be stated, including establishment of measures to complete the project within budget and on schedule, implementation of project cost and time contingency procedures, risk mitigation, and development of available risk mitigation capacity. The role that the RCMP plays in advancing the Grantee into the next stage of FTA approval should be noted.

Broad goals expected to be accomplished prior to the next stage of FTA approval should be noted. For example, for a project in the Preliminary Engineering (PE) phase, such goals may include (similar, phase-appropriate goals would apply to other project phases):

- Identification and adherence to environmental requirements, such as the National Environmental Policy Act (“NEPA”) requirements;
- Mitigation of design risks where possible during the PE phase, or otherwise an established plan for mitigation during the Final Design (FD) phase;
- Mitigation of other identified risk events;
- Reasoned analysis and assessment of likely market risks to be encountered;
- Cost and schedule risk mitigation capacity developed and implemented as needed, including targets achieved during the PE Phase and forecasted cost and schedule risk management mitigation capacity for subsequent phases;
- Uncertainty in cost estimates and forecasts and project schedule reduced, including tracking mechanisms to identify trends in known costs and risk reduction; and
- Maintenance of minimum cost contingency and schedule contingency targets.

Generally, detailed description of these or other broad goals is required to achieve measurable project evaluations; those descriptions and their metrics should be outlined in an appendix to the RCMP.

The RCMP should note that the Grantee and its local and state partners understand that the plan was developed in concurrence with the FTA, that implementation of the RCMP is an important consideration in further FTA approvals, and that the RCMP describes processes and requirements that must be adhered to, in addition to current FTA grant contracts and related FTA Circulars, regulations and guidance.

Risk Review Process

The section should include a description of procedures used for development of the Risk and Contingency Management Plan, including procedures for development of risk identification, risk assessment, risk response recommendations, risk protection measures (including Secondary Mitigation and minimum contingencies) and risk management and control.

[Note: In the following sections, the Grantee should provide an outline of its strategic, performance-based project management activities to identify, assess and respond to the project risks. It is the intent of the following to view risk management as a process of continual risk reduction; i.e., while the mitigation of any specific identified risk is an important activity, the identification, addition and mitigation of newly-discovered risks forms a process that provides both the Grantee and the FTA (through its PMOC) with the means and methods to best ensure satisfactory outcomes for the project. The goal of the RCMP is to provide a plan to take the Grantee project through the upcoming phase, and prepare it for possible entry into the next phase, with:

- 100% mitigation of risks identified for action during the upcoming phase;
- Fullest capture and planning to resolve or at least mitigate risks at the earliest possible time;
- Reasoned analysis and assessment of likely upcoming risks, including risks associated with Grantee's technical capacity;
- Cost and schedule risk mitigation capacity developed, implemented as needed, and targets achieved;
- Cost estimates and forecasts and project schedules continuing to be developed as planned; and
- Minimum cost contingency and schedule contingency targets continue to be achieved.]

Insurance

This section should include a summarized discussion of current or future major insurances provided to the project to respond to identified risk, including especially unusual, highly likely, or high exposure risk identified through the risk review process. Such insurances may include professional services, builders risk, wrap-up, or other specialized insurances purchased for reduction of risk exposure. Detailed insurance information should be included as an appendix to the RCMP.

Primary Mitigation

The primary mitigation section should include risks and mitigations noted in the risk reviews that require Grantee managerial, administrative, and technical action. The section should be organized as follows; each area below should include a brief summary of key risks and action items. A detailed listing of all identified risks and proposed mitigations should be included in an appendix, as further indicated below.

Technical Capacity:

The RCMP should summarize technical capacity risk identified in the FTA risk review and the Grantee's own risk identification process. A plan should be indicated for additional resource commitments, additional requirements for methods and resources, and improved management strategies to address the findings of risk. Management strategies should include specific plans or products, project control, responsibilities, authorities, and measures of performance.

Detailed risk issues related to Technical Capacity should be specifically cited in an appendix, and should be noted as *Technical Capacity Risks and Mitigations*. This list should include proposed mitigation

activities, responsibility for action and targeted date for completion.

Project Scoping and Design:

Requirements: A summary of important requirements risks and proposed mitigations should be discussed in the body of the report to provide a succinct overview of the outstanding risk mitigation work to be accomplished. In addition, all outstanding project requirements risks, including undefined project goals, third party requirements, and environmental considerations should be listed in an appendix, indicated as *Requirements Risks and Mitigations*. Such activities should also include risk associated with all NEPA compliant activities toward the development; public and governmental reviews and critiques,; and preparation of a Final Environmental Impact Statement (FEIS).

Design: A summary of important design risks and proposed mitigations should be discussed in the body of the report to provide a succinct overview of the outstanding design risk mitigation work to be accomplished. In addition, all design activities indicated in the risk review as potential risk events, including activities associated with unproven project technologies, unresolved alternate design approaches, late design, and others should be listed in an appendix, indicated as *Design Risks and Mitigations*. As appropriate, statements of subconsultant responsibilities for risk mitigation should be included.

Where value engineering efforts have been or will be undertaken, a summarized discussion of the effect on project risk should be discussed, including plans for closure of the value engineering process. Detailed value engineering items should be referenced elsewhere in the PMP, or included in an appendix if otherwise unavailable.

Delivery Methods and Contracting:

The purpose of this section is to illustrate the Grantee's plans for efficient risk allocation through choice of delivery method and through contractual risk allocation; such risks so considered should include common design, market, and construction risks as well as those risks identified in the risk review. All contracts should be considered, including design, vendor, and construction contracts. The Grantee should discuss the following:

- Strategies for contractual risk allocation or risk sharing through explicit contract language, ordinary custom/commercial/trade practices, or statutory authority such as the Uniform Commercial Code. The risk allocation plan should include allocations of future and prior contracted work, should complement other PMP sub-plans, such as the Contract Package Plan and future individual contracts, the Real Estate Acquisition Management Plan ("RAMP"), and all NEPA-related documentation;
- The effect of the chosen strategy on market pricing for the various contracts;
- Assessment of the contracted party's capacity to efficiently mitigate its allocated project risk exposure, including market risk, such that the risk allocation represents the best value for the project; and
- Actions to implement the strategy.

Detail for the proposed allocation strategy should be referenced elsewhere in the PMP or should be included in an appendix. Individual risks identified in the risk review should be indicated as *Delivery Methods and Contracting Risks and Mitigations*.

Construction Process:

The purpose of this section is to demonstrate the Grantee's plans for effective management of risk during the construction process. This section should include a discussion of the key construction phase risks identified in the risk review and plans to mitigate and respond to those risks. Especial attention should be placed on those risks that have not been wholly transferred to a contracted party. In addition, all outstanding project construction risks identified in the risk review should be listed in an appendix, indicated as *Construction Risks and Mitigations*.

Project Tracking:

The purpose of this section is to discuss those activities that will be put in place to ensure that adequate tracking and forecasting of cost and schedule outcomes are available to measure potential increased cost or time due to project risk. Such increases may require actions, such as use of contingencies or may trigger the implementation of Secondary Mitigation. This section should complement and may reference other related sections of the PMP. Where the risk review has identified risks associated with project cost and time tracking, a detailed listing of all identified risks and proposed mitigations should be included in an appendix, indicated as *Project Tracking Risks and Mitigations*. The section should be organized as follows; each area below should include a brief summary of key risks and action items:

Cost Estimating and Forecasting, Financing and Financial Management: discussion should include summarized findings of project cost and project cost uncertainty identified by the risk review, including the effect of schedule risk uncertainty on the cost risk results. Further, methods proposed to measure and improve the level of confidence in cost and financial estimates and forecasts should be discussed. Included within the discussion should be establishment of reliable estimates for the maximum dollar amount of the FTA financial contribution needed to implement or complete the project; if significant uncertainty exists in this funding forecast, a plan and delivery date for removing the uncertainty should be indicated.

The following efforts for reduction of cost uncertainty should be indicated or referenced elsewhere in the PMP:

- Continuous administrative and management efforts for increased detailed development of the cost estimate;
- Internal quality control to ensure adequate technical provision of all estimating and forecasting work;
- Methods for adjustment of cost schedules in reaction to realized schedule risks.

Detailed cost and cost risk information should be referenced as available elsewhere in the PMP or made available in an appendix to the RCMP.

Project Schedule Management: discussion should include summarized findings of project schedule forecasts and project schedule uncertainty as identified by the risk review, including any effect of cost risk uncertainty on the schedule risk results. Such external requirements as NEPA compliant related work and community involvement should be considered in the discussion of risk-related schedule management.

Plans to maintain schedule tracking should be discussed, including both design and construction schedules, to detect schedule deviation through techniques such as earned value. Such plans should indicate responsibility and frequency of reporting (usually monthly). Where appropriate, the RCMP should indicate efforts made to ensure that consultants and contractors comply with similar measures. Such tracking is important for the establishment of risk response actions, such as potential use of schedule

contingency; this discussion shall rely upon and complement schedule control discussions contained within the scheduling section of the PMP.

Contingency Management

The purpose of this section is to discuss the Grantee's plans for establishment and management of cost and schedule contingency protections. The section should be organized as follows:

Cost Contingency Management Plan:

- Results of cost contingency recommendations developed through the risk review, including, where available, minimum contingencies hold points by phase;
- Grantee plans to reach substantial conformance with the contingency recommendations on a timely basis;
- Procedures in place to implement and maintain throughout the project, a Cost Contingency Management Plan as an identifiable element in the RCMP, including authorities and procedures for distribution, transfer and use of all cost contingency in conformance with the requirements of this plan and sufficient documentation as each transfer occurs. This Cost Contingency Management Plan should also describe the manner in which the Grantee will forecast and trend the project contingency; and
- Grantee plans to recover in those cases where cost estimate forecasts indicate contingency levels have fallen below the minimum planned contingency hold points, including as necessary implementation of a formal Recovery Plan or adjustment of the expected project final cost with FTA approval.

Schedule Contingency Management Plan:

- Results of schedule contingency recommendations developed through the risk review;
- Grantee plans to reach substantial conformance with the contingency recommendations on a timely basis;
- Procedures in place to implement and maintain a Schedule Contingency Management Plan as an identifiable element in the RCMP, including authorities and procedures for distribution, transfer and use of all schedule contingency in conformance with the requirements of this plan and sufficient documentation as each transfer occurs. This Schedule Contingency Management Plan should also describe the manner in which the Grantee will forecast and trend the project contingency; and
- Grantee plans to recover in those cases where schedule estimate forecasts indicate contingency levels below the minimum planned contingency hold points, including as necessary a formal Recovery Plan or adjustment of the expected completion date for the project or appropriate milestones.

Secondary Mitigation

The purpose of this section is to discuss the Grantee's plans for establishment and management of Secondary Mitigation protections. The section should discuss the following:

- Results of Secondary Mitigation recommendations developed through the risk review, where available;
- A summary discussion of such Secondary Mitigation, including a brief description of a prioritized list of identified Secondary Mitigation items and the timing necessary for their implementation, especially including dates beyond which the items may no longer be effective;

- A discussion of those points of cost forecast at which Secondary Mitigation will be triggered for implementation; and
- Procedures in place to track such trigger points and to implement available Secondary Mitigation, including authority responsibility for such actions.

If the project has progressed to a stage at which no available Secondary Mitigation has been identified, this condition should be discussed in the report.

Risk Management and Risk Mitigation

The Grantee should describe its plans to implement, administer and maintain throughout the project, a Risk and Contingency Management plan for:

- Assessing (identifying and analyzing) project cost and schedule risk;
- Developing risk-handling options inclusive of primary risk mitigation;
- Developing a secondary mitigation plan to handle risk events or “triggered” mitigation activities;
- Monitoring risks to determine how risks have been handled or changed; and
- Documenting and reporting to the FTA the risk management program.

The risk management description should include such considerations as:

- Design control processes to detect potential consultant failure, such as scope, schedule, and budget “earned value” metrics;
- Clearly established Grantee, consultant, and contractor responsibilities for risk management;
- Plans for amendment of the risk register during the course of the work, to both succinctly catalogue additional significant issues that arise, as well as to identify closure of issues as they become resolved to the satisfaction of the Grantee and the FTA; and
- Plans and timing for systematically updating the RCMP.

APPENDIX H

Risk Report Format

Reporting Contents and Format

Reporting should occur soon after conclusion of the risk workshops; timely reporting will facilitate Grantee's early adoption of the recommended risk mitigation measures into its Project Management Plan.

In the conduct of this report, the PMOC shall use its professional judgment to identify and categorize, assess and evaluate the uncertainties in the Grantee's project information, considering the project's administrative, management, political, legal, financial and physical conditions. The PMOC will document and report its professional opinions and its recommendations for responding to identified risk, including recommendations for mitigations including contingencies. Unless otherwise directed, the report will be sectioned as follows:

Title Page Include disclaimer, below.

Disclaimer *Insert:* This Project Management Oversight Contractor (PMOC) report and all supporting reports and back up materials contain the findings, conclusions, professional opinions and recommendations stemming from a risk-informed evaluation and assessment, prepared solely for the Federal Transit Administration (FTA). This report should not be relied upon by any party, except FTA or the Grantee (Project Sponsor), in accordance with the purposes of the evaluation and assessment as described below. For projects funded through FTA's Major Capital Investment (New Starts) program, FTA and its PMOCs use a risk-informed assessment process to review and validate a Grantee's scope, schedule, and cost, and to analyze the Grantee's project development and management. This process is iterative in nature. The results represent a "snapshot in time" for a particular project under the conditions known at that point. The evaluation or assessment and related results may subsequently change due to new information, changes in circumstances, additional project development, specific measures a Grantee may take to mitigate risks, Grantee's selection of strategies for project execution, etc.

Table of Contents

List of Figures and Tables

Executive Summary The PMOC should provide an executive summary in three pages or less that includes the following:

- 1) Purpose
- 2) Project Description
- 3) Results and Recommendations - PMOC's professional opinion regarding:
 - a) Contract packaging review and assessment
 - b) Total project cost including statement of potential range of cost (lower, upper bound and most likely); also cost contingency
 - c) Project schedule and schedule contingency
 - d) Top Risks, mitigations, and recommended actions
 - e) Top Risk Mitigations, including Recommendations for action

Project Background Project descriptions and data shall be consistent with the Monitoring report

guidance, current monitoring report and the most recent FTA New Start profile. Notwithstanding the foregoing, the work order manager may direct the contractor to use an identifiable draft version of these materials. Ridership shall include peak hour ridership data. Sub-sectioning shall also include Guideway Components, Project Delivery Method, proposed Contract Packaging Strategy and, as applicable, Master Planning for the Corridor.

Summary of Project Status from other OPs. Summary-level information from: Grantee Technical Capacity and Capability, Project Scope, Project Estimate, and Project Schedule reviews. Include specifically elements from prior reviews that are particularly important to developing understanding of the issues presented later in this report.

Contract Packaging Review

Review and Analysis of Contract Package Strategy

Identify and characterize the contract packaging strategy and significant individual contract packages, including pricing/compensation components. Assess and evaluate the effective mitigation capacity of the subject contract package pricing/compensation components, including the alignment with the Grantee's project planning documents.

Review and Analysis of Risk Allocation and Assessment

Identify and characterize contractual risk allocations, especially those that are not customarily transferred or that expose the Grantee to unusual or unexpected risk. Characterize the total amount of such risk allocations, including both allocations of risk that are removed and acquired by the Grantee.

Provide an assessment for negotiated transfer of risk, including whether the costs of such transfer is considered within the Grantee's base estimate and/or schedule, and whether the cost of such transfer is balanced with the expected benefit of risk transference. Provide recommendations for action as appropriate.

Risk Identification Provide a summary of the process for identification of risks, and provide a narrative discussion of key risk events (categorized by SCC), including their potential impact on the project. Characterize the remaining elements of the Risk register, which is to be attached as an appendix.

Risk Assessment

For projects with prior risk reviews, include comparisons of the currently-assessed project risk to the prior-assessed project risks and comment on the changes indicated.

Cost Risk Assessment Methodology This purpose of this section is to describe the PMOC's methodology used to deliver the risk assessment products, with separate sections for risk assessment, mitigation, and contingency recommendations.

SCC Category Risk Assessment Present the cost estimate adjustments and selection of Beta Range Factors (BRFs) for the SCC Category Cost Risk Assessment, including characterization of specific risks that influence non-standard BRFs. The PMOC shall present detailed data and analysis in a separate appendix as necessary in order to maintain readability of the report.

Project Cost Risk Assessment The purpose of this section is to present the contractor's initial model-based Project Cost Risk Assessment, including a narrative and appropriate graphics that

explain the primary findings from the project cost risk model.

Schedule Risk Assessment Methodology The purpose of this section is to describe the PMOC's methodology used to deliver the schedule risk assessment with separate discussion for development of risk assessment, mitigation, and contingency recommendations.

Summary Schedule Development and Risk Modeling This section shall present the findings resulting from development of the summary schedule activities, specifically: ranges for activity durations in the summary schedule, including characterization of specific risks that influence important schedule activities; characterization of the results of the schedule risk modeling, including confidence levels for achieving the Grantee's Revenue Operations target; the PMOC's professional opinion regarding the most likely schedule for Revenue Operations; and PMOC's recommended actions.

Risk Mitigation The purpose of this section is to present the PMOC's recommendation for specific risk mitigation efforts by the Grantee to reduce the perceived risks and potential variability of cost and schedule. The PMOC's narrative should allow FTA management and the Grantee to maintain focus upon these risk mitigation efforts as the means to maintain the baseline cost estimate and avoid the potential cost escalation from these potential project risks.

The report should include separate subsections for Primary Mitigation, Secondary Mitigation and Contingency Recommendations.

Primary Mitigation Specific mitigation recommendations shall be presented, including appropriate timeframes for completion of the mitigation activity. Where possible, link the mitigation activity to the risk register and/or the assignment of exceptional Beta Range Factors. Such mitigation recommendations shall be segregated by SCC and Risk Category.

For projects with prior risk reviews, include discussions (as appropriate for project phase) of Grantee's historic mitigation efforts by Risk Category, including Requirements risk status, Design risk status, Market/bid Risk status, and Construction Risk status, (and, if appropriate, the subcategories of Construction Risk).

Secondary Mitigation Provide recommendations for amounts of Secondary Mitigation capacity to be developed by the Grantee. Where the risk review has provided such, include suggested areas for potential Secondary Mitigation.

Contingency Provide a narrative indicating minimum recommended levels of both cost and schedule contingency, including a summary of the basis for development of the recommended minimums. Further, provide the PMOC's recommendations for contingency hold points, including tabular and graphical presentations.

Monitoring Plan Basis Indicate a plan for testing the implementation and effectiveness of Grantee mitigation measures on the Federal project.

Conclusion

Appendices (as required, including)

Risk Register

Grantee Data Characterization provide a descriptive listing of documents used in this analysis, including a narrative characterization of their completeness and sufficiency as appropriate for the project phase during which this review was conducted.